of pimelinic acid, by A. Bauer and J. Schuler.—New experiments to test Doppler's theory on the change of tone and colour by motion, by E. Mach.—On the magnetic declination and inclination at Vienna, by J. Liznar.—On the component parts of coralline and their relation to the colouring-matters of the rosaniline group, by C. Zulkowsky.—On the diffusion of carbonic acid by water and alcohol, by J. Stefan.—On the electromotive power of metals in the watery solutions of their sulphates, nitrates, and chlorides, by Dr. F. Streintz.

THE *Sitzungsberichte* of the Vienna Academy of Sciences (Physiological and Anatomical Section, vol. 76, parts 1-5) contain the following papers:—Observations on the origin of the cell nodule, by S. Stricker.—On the nerves of the cornea and its vessels, by Dr. L. Königstein.—On the properties of dialysed albumen, by Dr. M. Laptschinsky.—On the occurrence of two different knots of vessels in the kidney, by Dr. O. Drasch.—On some peculiar products of mycotic keratitis giving the amyloid reaction, by Dr. A. Frisch.—On the chemical reaction of the retina and the visual nerve, by Dr. A. Chodin.—On the laws of nerve irritation, by Dr. E. v. Fleischl.—On the termination of the olfactory nerves, by S. Exner.—On optional and cramp movements, by E. Brücke.—Researches on the perception of locality and its relation to the idea of space, by S. Stricker.—On the anatomy of the thalamus opticus and its surroundings, by Dr. F. Schnopfhagen.

SOCIETIES AND ACADEMIES

LONDON

Royal Society, March 6.—"Preliminary Report upon the *Comatulæ* of the *Challenger* Expedition." By P. Herbert Carpenter, M.A., Assistant Master at Eton College. Communicated by Sir Wyville Thomson, F.R.S. Published by permission of the Lords Commissioners of the Treasury.

The collection of *Comatulæ* made by the staff of the *Challenger* includes specimens from 45 different localities, but few of which are deep-water stations. *Comatulæ* were only obtained seven times from depths exceeding 1,000 fathoms.

At lesser depths, 200—1,000 fathoms, *Comatulæ* were met with at 13 stations; but by far the greatest number both of species and of individuals were dredged at depths much less than 200 fathoms, and often less than 20 fathoms, at 26 widely distant stations.

The collection contains 111 species, mostly new; but as the work of examination and description progresses, it is not unlikely that forms now considered different may turn out to be merely local varieties of one and the same species, so that the number given above may be subject to alteration.

Of these 111 species, 59 belong to the genus *Antedon*, 48 to *Actinometra*, 1 to *Ophiocrinus*, and 3, which are peculiar in having ten rays to the calyx instead of only five, to a new genus for which is proposed the name *Promachocrinus* (πρόμαχος *Challenger*).

The distribution of *Promachocrinus* is as follows:—

P. Kerguelensis (20 arms).	Balfour Bay, Kerguelen,	20—60 fath.
	Royal Sound ,,	28 fath.
	Cape Maclear ,,	30 ,,
	Heard Island	75 ,,
P. abyssorum (10 arms).	Station 147	1,600 ,,
	,, 158	1,800 ,,
P. Naresii (10 arms).	,, 214	500 ,,

Ophiocrinus was obtained at four localities at depths varying from 565 to 1,070 fathoms, two in the South Pacific off South Australia and New Zealand respectively, and two in the North Pacific, one off Japan, and one just north of the Philippine Islands. All the specimens belong to one species, which is by no means so slender and graceful as Semper's Philippine species from shallower water, but has a much more massive arm skeleton.

The comparative distribution of the other *Comatulæ* is very striking. Relatively speaking, *Actinometra* is extremely limited in its range, both geographical and bathymetrical. It is almost exclusively a tropical genus, its northern limit being about 30° N. lat. and its southern 40° S. lat. Isolated species are known from the Cape of Good Hope, Natal, South Australia, and Port Jackson, but its chief home is Oceania, especially the Philippines and Moruccas. A few *Actinometra* species are also known from the west coast of the Atlantic, as South Carolina, the West Indies, Bahia, and St. Paul's Rocks.

The bathymetrical limit of *Actinometra* is likewise very slight. Nearly all the *Challenger* species are from depths less than 20 fathoms, while only three come from a greater depth than 100 fathoms. The individual species of *Actinometra*, like the genus itself, are very local in their distribution. Each of the forty-eight species of the *Challenger* collection has its own locality.

With *Antedon*, however, the case is different. Not only do nearly all the deep-sea *Comatulæ* belong to this genus, but some species of it have a fairly wide range. *Ant. rosacea* ranges from the north of Scotland to the Mediterranean, while *Ant. Eschrichtii* is found over a much wider area. It is well known on the American coast, and was dredged by the *Challenger* off Halifax, while the *Porcupine* met with it in the "cold area" of the North Atlantic.

Some *Antedon* species occur in duplicate from different localities. Two species from near the Kermadec Islands (S. 170), also occur in the neighbourhood of the Fijis (S. 174, 175). A third species was dredged at Stations 147 and 160, two localities in the Southern Sea, in nearly the same latitude, but separated by almost 90° of longitude. A fourth species came up from 1,070 and 775 fathoms, off the Admiralty Islands and Japan respectively.

The above facts would seem to show that, with few exceptions, the geographical range of the individual members of the family *Comatulidæ*, is exceedingly limited, nearly every species having its own locality, and that not a very extensive one.

The voyage of the *Challenger* has settled a curious question in connection with the Crinoids, the origin of which is due to Lovèn. It refers to *Hyponome Sarsii*, a so-called recent Cystid, which turns out to be nothing more than the disk of a *Comatula*, minus its skeleton. The anambulacral plating may be very extensive, forming a complete pavement over the ventral surface of the disc as in many *Pentacrini*; and the ambulacra are not wide and open as is usual in most *Comatulæ*, but almost entirely closed by the approximation of the marginal leaflets at their sides, so that the food-grooves radiating from the mouth are converted into tunnels.

The plates in the marginal leaflets are probably movable as unplated leaflets are in *Antedon rosacea*; so that they can be erected when the arms are spread out, leaving the grooves open for food particles to travel towards the mouth. On the other hand, when the arms are all contracted over the disk, the marginal plates fold over the grooves and cover them in. This is the condition of most spirit-specimens, but it is not in any way comparable to that of the palæozoic crinoids, in which the mouth is truly subtegminal while the ambulacra become real tunnels beneath the upper surface of the vault.

Sections through one of these plated *Hyponome*-disks show that all the various structures which underlie the grooves of ordinary *Comatulæ* are present and exhibit their usual characters.

The examination of the *Challenger Comatulæ* has entirely confirmed the opinions held by Dr. Lütken and the author respecting the distinguishing characters of *Antedon* and *Actinometra*. Both agree in referring forms with a (sub) central mouth, five equal ambulacra, and no terminal comb on the oral pinnules, to *Antedon*. On the other hand, species with an eccentric mouth, a variable number of unequal ambulacra, and a terminal comb to the oral pinnules, belong to *Actinometra*.

It will be seen at once that these characters are of no use in distinguishing the genera of fossil *Comatulæ*. But, there are very considerable differences in the shape of the radials and centrodorsal piece in *Antedon* and *Actinometra* respectively, and as these are exactly the parts which are most met with as fossils, the generic determination of a fossil form is almost as easy as that of a recent one, which has given up its disk to produce a *Hyponome*. The author has shown elsewhere that in *Act. polymorpha* and *Act. solaris*, half, or even more than half, of the arms may have neither ventral groove, tentacles, ambulacral epithelium, nor ambulacral nerve. No less than 23 out of the 48 species of *Challenger Actinometræ* may have more or fewer of such ungrooved arms, in which the ambulacral nerve is entirely absent. These arms are usually those which come off from the hinder part of the disc, but in one gigantic Philippine species with over 100 arms, there are several ungrooved arms on each radius. Evidence of this negative character appears to the author to be a serious objection to the German view, that the ventral bands constitute the sole nervous apparatus of the crinoids; and on the other hand, to strengthen the opinions held by Dr. Carpenter, and by the author, that the axial cords of the skeleton are also nervous in character.

"Observations on the Physiology of the Nervous System of the Crayfish (*Astacus fluviatilis*)," by James Ward, M.A., Fellow of Trinity College, Cambridge. Presented by Michael Foster, M.D., F.R.S., Prælector of Trinity College, Cambridge.

The experiments, of which this paper gave a brief account, consisted mainly in severing (1) one or (2) both of the supra-œsophageal commissures, (3) both the sub-œsophageal commissures, or (4) in dividing the supra-œsophageal ganglia longitudinally. From these experiments it was inferred:—

(*a*) That there is no decussation of the longitudinal fibres in the nervous system of the crayfish.

(*b*) That on the presence of the supra-œsophageal ganglion depend (1) the spontaneous activity of the animal as a whole, or what might be called its volitional activity; (2) the power to inhibit the aimless and wasteful mechanical activity of the lower centres; (3) the power to maintain equilibrium; and (4) the use of the abdomen in swimming.

(*c*) That the sub-œsophageal ganglion is the centre for co-ordinating (1) the locomotive, and (2) the feeding movements, and (3) for a peculiar rhythmic swing of the limbs seen as soon as the supra-œsophageal ganglia are removed, and (4) is the source of a considerable amount of motor energy.

(*d*) That there is much less solidarity, a much less perfect *consensus*, among the nervous centres in the crayfish than in animals higher in the scale. The brainless frog, *e.g.*, is motionless, except when stimulated, and even then does nothing to suggest that its members have a life on their own account; whereas the limbs of a crayfish deprived of its first two ganglia, are almost incessantly preening, and when feeding movements are started, the chelate legs rob, and play at cross purposes with, each other as well as four distinct individuals could do.

(*e*) That some stimulus from other centres is more or less necessary to the activity of any given centre.

(*f*) The "natural" discharge of a ganglionic centre (not exhibiting "volition") appears to be of a rhythmic kind; the rhythmic movements becoming converted into varied movements by temporary augmentation or inhibition.

Zoological Society, March 4.—Prof. W. H. Flower, F.R.S., president, in the chair.—Mr. Sclater exhibited and made remarks on examples of two rare Fruit Pigeons, of the genus *Carpophaga*.—Mr. L. M. D'Albertis exhibited some new and rare birds, obtained during his recent expedition up the Fly River, New Guinea.—Prof. Newton exhibited, on behalf of Mr. J. Robinson, of Trinity Hall, Cambridge, a specimen of *Sylvia nisoria*, believed to have been killed at Cambridge many years ago.—A communication was read from Mr. L. Taczanowski containing a list of the birds collected by Messrs. Stolzmann and Jelski, in Northern Peru in 1878. Fifty-six species were enumerated, several of which were new to science.—Mr. R. Bowdler Sharpe, F.Z.S., read some notes on birds obtained on Kina-Balu Mountain, in North-Western Borneo, by the collectors of Mr. Treacher, amongst which were several species new to science.—Mr. F. Jeffrey Bell read the first portion of some observations on the characters of the Echinoidea. The present paper contained remarks on the species of the genus *Brissus* and on the allied forms *Meoma* and *Metalia*.—A communication was read from the late Mr. F. Smith, F.Z.S., containing the descriptions of new species of *Hymenoptera* from Central America.—A communication was read from Mr. W. A. Forbes, F.Z.S., containing a synopsis of the Meliphagine genus *Myzomela*, to which was also added the descriptions of two new species.—A communication was read from the Rev. O. P. Cambridge, containing descriptions of some new and little known species of Araneidea, principally belonging to the genus *Gasteracantha*.

Chemical Society, March 6.—Dr. Gladstone, president, in the chair.—The following papers were read:—On the quantitative blowpipe assay of mercury, by G. Attwood. The method consists in distilling the compounds either alone or mixed with litharge or with oxalate of potash and cyanide of potassium in ingeniously contrived retorts of glass or steel, the whole apparatus being three to four inches long, collecting the mercury in water, and weighing it when dry.—On some points in the analysis of combustible gases and in the construction of apparatus, by J. W. Thomas. The author has succeeded in exploding marsh-gas, &c., with almost theoretical quantities of oxygen, by using a diminished tension, about 160 mm. As less oxygen is thus required, the author has shortened the eudiometer tube to 500 mm. and thereby increased the delicacy of the apparatus; he has also reintroduced a steel tap, of, however, perfect tightness, and has in several points perfected and simplified the ordinary Frankland's and McLeod's apparatus. The steel face plates connecting the laboratory and measuring-tubes have also been abandoned.—On the action of isomorphous salts in exciting the crystallisation of super-saturated solutions of each other, and some experiments on super-saturated solutions of mixed salts, by J. M. Thomson. The author finds that a crystal to act as a nucleus must be not only isomorphous, but chemically similar, as to the water of crystallisation and to the substance in solution. Interesting results were obtained by introducing a nucleus into a super-saturated solution of two non-isomorphous bodies; under certain conditions a separation of these two bodies could be effected.—On the isomeric dinaphthyls, by Watson Smith. The author has determined the vapour densities of the dinaphthyls by means of V. Meyer's new apparatus, and gives in his paper the results of the reaction of carbon tetrachloride, chloroform, &c., on naphthalene.

Geological Society, February 21.—Henry Clifton Sorby, F.R.S., president, in the chair.—George Bond, Francis Gaskell, and George Henry Hollingworth, were elected Fellows of the Society.—The following communications were read:—A copy of a letter from the late Acting-Governor of the Falkland Islands, relating to the overflow of a peat-bog near Port Stanley, in East Falkland. Communicated by H.M. Secretary of State for the Colonies.—Note on *Poikilopleuron bucklandi*, of Eudes Deslongchamps (*père*), identifying it with *Megalosaurus bucklandi*, by J. W. Hulke, F.R.S.—Note on a femur and a humerus of a small mammal from the Stonesfield slate, by H. G. Seeley, F.L.S., F.G.S., Professor of Geography in King's College, London.—A review of the British carboniferous Fenistellidæ, by G. W. Shrubsole, F.G.S.

Anthropological Institute, February 25.—Mr. John Evans, D.C.L., F.R.S., vice-president, in the chair.—A paper by Mr. C. Staniland Wake, on the primitive human family, was read by the Director. The author endeavoured to combat some of the views usually associated with the name of Mr. McLennan.—Mr. E. W. Brabrook, F.S.A., read a paper entitled "Notes on the Colour of the Skin, Hair, and Eyes." The paper accompanied an exhibition of the "Echelle de Couleurs," published by the Société Sténochromique of Paris. The accurate determination of the colours of the skin, hair, and eyes, is a matter of great interest to anthropologists, and the author considered that though the object of the publication of this scale of colours was not exclusively anthropological, yet its value to anthropologists would be very great. Forty-two colours are specialised, of each of which there are about twenty shades.

Victoria (Philosophical) Institute, February 3.—Prof. McK. Hughes, F.R.S., delivered a lecture upon the antiquity of man, in which he analysed the nature of the evidence brought forward by others.

CAMBRIDGE

Philosophical Society, February 24.—Prof. Liveing, president, in the chair.—Prof. Cayley gave an account of an investigation which he had been led to, relating to what he calls the "Newton-Fourier Imaginary Problem." The Newtonian process of approximation to the root of a numerical equation $f(u) = 0$, consists in deriving from an assumed approximate root ξ, a new value $\xi_1 = \xi - \frac{f(\xi)}{f'(\xi)}$ which should be a closer approximation to the root sought for; taking the coefficients of $f(u)$ to be real, and also the root sought for, and the assumed value ξ, to be each of them real, Fourier investigated the conditions under which ξ_1 is in fact a closer approximation. But the question may be looked at in a more general manner; ξ may be any real or imaginary value, and we have to inquire in what cases the series of derived values $\xi_1 = \xi - \frac{f(\xi)}{f'(\xi)}$, $\xi_2 = \xi_1 - \frac{f(\xi_1)}{f'(\xi_1)}, \ldots$ converge to a root, real or imaginary, of the equation $f(u) = 0$. Representing as usual the imaginary value $\xi, = x + iy$, by means of the point whose co-ordinates are x, y, and in like manner $\xi_1, = x_1 + iy_1$, &c.; then we have a problem relating to an infinite plane; the roots of the equation are represented by points $A, B, C, \ldots$; the value ξ is represented by an arbitrary point P; and from this by a determinate geometrical construction we obtain the point P_1, and thence in like manner the points $P_2, P_3 \ldots$ which represent the values $\xi_1, \xi_2, \xi_3 \ldots$ respectively. And the problem is to divide the plane into regions, such that starting with a point P_1 anywhere in one region, we arrive ultimately at the root *A*; anywhere in another region we arrive ultimately at the root *B*; and so on for the several roots of the equation. The division into regions is made without difficulty in the case of a quadric equation, but in the next succeeding case, that of a cubic equation, it is anything but obvious what the division is, and the author had not succeeded in finding it.

MANCHESTER

Literary and Philosophical Society, February 4.—E. W. Binney, vice-president, F.R.S., in the chair.—The area of the middle drifts as determined by their contents, by Alfred Bell, F.G.S. Communicated by R. D. Darbishire, F.G.S.

February 18.—J. P. Joule, F.R.S., &c., president, in the chair.—On a chemical investigation of Japanese lacquer, or "urushi," by Sadamu Ishimatsu. Communicated by Prof. Roscoe, LL.D., F.R.S.—On the bursting of the gun on board the *Thunderer*, by Prof. Osborne Reynolds, F.R.S., Professor of Engineering, Owens College, Manchester.

BOSTON, U.S.

Society of Natural History, October 2, 1878.—Notes on the physical geography and geology of Trinidad, by W. O. Crosby.

October 16.—The peculiarities in the growth of the Swamp Cypress (*Taxodium distichum*).

October 23.—Museum pests observed in the entomological collection at Cambridge, by Dr. H. A. Hagen.

November 6.—A century of orthoptera. Decade viii. Acridii (Melanoplus), by S. H. Scudder. Decade ix. Acridii (Pezotettix).

VIENNA

Imperial Academy of Sciences, January 23.—The following, among other papers, were read:—Measurements on simultaneous oscillation, by Prof. von Ettingshausen. This relates to a suspended and swinging coil of wire, the currents of which set a galvanometer needle swinging.—On curves of the fourth order with three double points, by Herr Ameseder.—On the diffusion of liquids (second part), by Herr Stephan.

February 6.—On some new and rare fish-species in the zoological museums of Vienna, Stuttgart, and Warsaw, by Dr. Steindachner.—On the occurrence of chlorophyll in the epidermis of leaves of phanerogams, by Herr Stöhr.—On the phenomena in the circulation after temporary closure of the aorta; contribution to the physiology of the spinal chord, by Prof. Mayer.—On the transformation of iodide of phenol into dioxybenzol, by Prof. Lippmann and Herr v. Schmidt.—Variations in structure and growth of the mesentery of the human intestine, by Prof. Toldt.—On organic ferricyanide compounds, by Herr Bernheimer.—Action of the fusing hydrate of soda on phenol, and synthesis of phloroglucin, by Herren Barth and Schreder.

February 13.—On muscular sounds of the eye, by Prof. Hering.—Covellin as a superficial pseudomorphism of a Celtic axe of bronze found at Salzburg, near Hallstatt, by Dr. v. Hochstetter.—Oxidation of resorcin to phloroglucin, by Professors Barth and Schreder.—Remarks on Dr. Wangen's memoir on the geographical distribution of fossil organisms in India, by Herr Wynne.

PARIS

Academy of Sciences, March 3.—M. Daubrée in the chair.—The following papers were read:—Reply to M. van Tieghem concerning the origin of *Amylobacter*, by M. Trécul.—Researches on the fœtal envelopes of the armadillo with nine bands, by M. Milne-Edwards. Exceptionally to the rule with mammalia, the four fœtuses of this armadillo are all lodged in a common chorion.—The waters of the Cheliff; some observations regarding the interior sea of Algeria, by M. Balland. The Cheliff is the principal water-course of Algeria, and flows to the Mediterranean. At present it carries down over three million tons of earthy matters (chiefly silica and clay) in twenty-four hours; this would give a layer 1 metre thick, over 300 hectares. The numerous Saharan rivers lost in the Chotts also convey large quantities of earth and sand; then there is the sand displaced by winds. These considerations are urged against the interior sea.—Discovery of a small planet at the Observatory of Marseilles, by M. Stephan.—Extract from a letter from P. Ferrari, relating to the intra-Mercurial planet. This calls attention to an important observation by P. De Vico in 1837 (which seems to have escaped Leverrier's notice), on a planet-like body which then passed over the sun's disk.—Formulæ relative to the theory of planetary perturbations, by M. de Gasparis.—On the multiplication of elliptic functions, by M. Halphen.—Resolution of a class of congruences, by M. Pellet.—On the emissive power of coloured flames, by M. Gouy.—On the spectra of absorption of didymium, and of some other substances extracted from samarskite, by M. Soret. The facts indicate the existence, in the didymium from samarskite, of a substance at least different from didymium. The same substance seems to be in less quantity in terbine, and in least in the didymium from cerite.—Action of sulpho-cyanate of ammonium on monochlorised acetone, by MM. Norton and Tcherniak.—On amidised acids derived from butyric and isovaleric acids, by M. Duvillier.—Researches on digestion in cephalopod molluscs, by M. Jousset de Bellesme. The posterior salivary glands of the poulpe facilitate the digestion of albuminoids, laying bare the muscular fibre for action of the chief digestive juice. The upper salivaries are merely connected with mastication and swallowing. The animal has a digestive aptitude only for albuminoid and connective matters; and this is the more remarkable because some of its organs, *e.g.*, the liver, contain a large amount of fatty matters.—Researches on *Peronospora gangliiformis* of lettuce, by MM. Bergeret and Moreau. Water slightly acidulated with nitric acid is a good remedy; it poisons the Peronospora and is a manure for the soil.—Influence of oxygen on alcoholic fermentation by beer yeast, by M. Bechamp. In a first series of experiments pure oxygen was conducted into the fermenting mixture continuously. In a second series the electrodes from a battery of six or eight Bunsen elements were put in the mixture; the gases of fermentation were collected, and the oxygen proved to be mostly absorbed. Oxygen acts as an excitant, stimulating the life of the yeast and the mutations of its matter. In the first period of fermentation (with the current) the absolute quantity of alcohol formed was greatest; it diminished to the end. The acetic acid increased from the beginning. The sugar-water absorbs part of the oxygen. Pure yeast in water under weak electrolytic action, may absorb all the oxygen.—On a method of conservation of infusoria, by M. Certes. He employs a solution (2 per cent.) of osmic acid. The important point is to make the reagent act promptly and with a certain force. One way, suitable for most cases, is to expose infusoria on a glass plate to the vapours of osmic acid for ten to thirty minutes. For very contractile infusoria, a drop of the reagent is deposited on the cover before covering the drop of water which contains them. Excess of liquid is removed with Joseph paper; two opposite sides of the cover glass are luted with paraffin or Canada-balsam; and for coloration a mixture of glycerine, picrocarminate, and water (equal parts) is used.—On the unity of forces in geology (continued), by M. Hermite. He offers objections to the hypothesis of igneous fluidity. The present form of the earth is attributed to the presence of its seas. Volcanic phenomena do not agree with the existence of central fire, or even a sea of lava of small extent.—On the hurricane which traversed Switzerland on February 20, 1879, by M. Forel. He finds in the data strong proof of a gyratory motion of the atmosphere.—Theory of glazed frost; reclamation of priority, by M. Nouel.—On some former examples of glazed frost similar to that of January last, by M. Vogt. He gives an account of one instance of the phenomenon observed at Geneva in 1856.

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